THE INVENTION CLAIMED IS

1. A method of noninvasively focusing acoustical energy on a mass within a substance to reduce or eliminate said mass, comprising the steps of:

detecting the presence of said mass in said substance by applying acoustic energy to said substance,

localizing said mass to determine its position within said substance,

developing temporal signatures to drive said acoustical energy on said mass, and

dynamic focusing said acoustical energy on said mass in said substance utilizing said temporal signatures to reduce or eliminate said mass.

2. The method of noninvasively focusing acoustical energy on a mass of claim 1 wherein said step of dynamic focusing said acoustical energy on said mass utilizes time reversal.

3. The method of claim 2 including identifying a point of interest within said substance and placing a small seed at said point of interest to enhance said time reversal.

4. The method of noninvasively focusing acoustical energy on a mass of claim 1 wherein said step of dynamic focusing said acoustical energy on said mass utilizes time reversal eigen-decomposition.

5. The method of noninvasively focusing acoustical energy on a mass of claim 4 wherein including the step of acquiring the multistatic data matrix using sets of orthogonal weights to increase signal-to-noise ratio.

6. The method of noninvasively focusing acoustical energy on a mass of claim 4 wherein eigen-weights are selected so that corresponding singular values fit a desired pattern.

7. The method of noninvasively focusing acoustical energy on a mass of claim 4 wherein eigen-weights are selected to minimize the error with a given reference.

8. The method of noninvasively focusing acoustical energy on a mass of claim 7 wherein a reference is calculated using a simple propagation model.

9. The method of noninvasively focusing acoustical energy on a mass of claim 1 wherein said step of dynamic focusing said acoustical energy on said mass utilizes modeling and time reversal.

10. The method of noninvasively focusing acoustical energy on a mass of claim 1 wherein said step of step of dynamic focusing said acoustical energy on said mass utilizes modeling.

11. The method of noninvasively focusing acoustical energy on a mass of claim 1 wherein said step of detecting the presence of said mass in said substance comprises transmitting an initial acoustic signal into said substance for detecting said mass and detecting said initial acoustic signal.

12. The method of noninvasively focusing acoustical energy on a mass of claim 11 wherein said step of developing temporal signatures to drive said acoustical energy on said mass comprises digitizing said initial acoustic signal and time-reversing said digitized initial acoustic signal.

13. The method of noninvasively focusing acoustical energy on a mass of claim 12 wherein said step of dynamic focusing said acoustical energy on said mass in said substance comprises using said time-reversed initial acoustic signal in focusing said acoustical energy on said mass in said substance.

14. The method of noninvasively focusing acoustical energy on a mass of claim 1 wherein said step of detecting the presence of said mass in said substance

comprises applying acoustic energy propagated into said substance using an array of ultrasonic transducers.

15. The method of noninvasively focusing acoustical energy on a mass of claim 1 wherein said step of dynamic focusing said acoustical energy on said mass in said substance utilizing time reversal generates heat.

16. The method of noninvasively focusing acoustical energy on a mass of claim 15 wherein said heat essentially cooks said mass insuring reduction or elimination of said mass.

17. The method of noninvasively focusing acoustical energy on a mass of claim 1 wherein said step of dynamic focusing said acoustical energy on said mass in said substance utilizing time reversal mechanically disrupts said mass.

18. A method of treating tissue by noninvasively focusing acoustical energy on a mass within said tissue to reduce or eliminate said mass, comprising the steps of:

detecting the presence of said mass in said tissue by applying acoustic energy to said tissue,

localizing said mass to determine its position within said tissue,

developing temporal signatures to drive said acoustical energy on said mass, and

dynamic focusing said acoustical energy on said mass in said tissue utilizing said temporal signatures to reduce or eliminate said mass.

19. The method of treating tissue of claim 18 wherein said step of dynamic focusing said acoustical energy on said mass utilizes time reversal.

20. The method of treating tissue of claim 19 including the steps of identifying a point of interest in said tissue and placing a small seed at said point of interest to enhance said time reversal.

21. The method of treating tissue of claim 18 wherein said step of dynamic focusing said acoustical energy on said mass utilizes time reversal eigen-decomposition.

22. The method of treating tissue of claim 21 including the step of acquiring multistatic data matrix uses sets of orthogonal weights to increase signal-to-noise ratio.

23. The method of treating tissue of claim 21 including selecting eigen-weights so that corresponding singular values fit a desired pattern.

24. The method of treating tissue of claim 21 wherein said eigen-weights are selected to minimize the error with a given reference.

25. The method of treating tissue of claim 24 wherein a reference is calculated using a simple propagation model.

26. The method of treating tissue of claim 18 wherein said step of step of dynamic focusing said acoustical energy on said mass utilizes modeling and time reversal.

27. The method of treating tissue of claim 18 wherein said step of step of dynamic focusing said acoustical energy on said mass utilizes modeling.

28. The method of treating tissue of claim 18 wherein said step of detecting the presence of said mass in said tissue comprises transmitting an initial acoustic signal into said tissue for detecting said mass and detecting said initial acoustic signal.

29. The method of treating tissue claim 28 wherein said step of developing temporal signatures to drive said acoustical energy on said mass comprises digitizing said initial acoustic signal and time-reversing said digitized initial acoustic signal.

30. The method of treating tissue of claim 29 wherein said step of dynamic focusing said acoustical energy on said mass in said tissue comprises using said time-reversed initial acoustic signal in focusing said acoustical energy on said mass in said tissue.

31. The method of treating tissue of claim 18 wherein said step of detecting the presence of said mass in said tissue comprises applying acoustic energy propagated into said tissue using an array of ultrasonic transducers.

32. The method of treating tissue of claim 18 wherein said step of dynamic focusing said acoustical energy on said mass in said tissue utilizing time reversal generates heat.

33. The method of treating tissue of claim 32 wherein said heat essentially cooks said mass insuring reduction or elimination of said mass.

34. The method of treating tissue of claim 18 wherein said step of dynamic focusing said acoustical energy on said mass in said tissue utilizing time reversal mechanically disrupts the tissue.

35. The method of treating tissue of claim 18 wherein said step of dynamic focusing said acoustical energy on said mass in said tissue utilizing time reversal increases the porosity of the cell membranes in the tissue.

36. The method of treating tissue of claim 35 wherein said increase of cell membrane porosity enhances the uptake of chemical or genetic therapeutic agents.

37. The method of treating tissue of claim 18 wherein said step of dynamic focusing said acoustical energy on said mass in said tissue utilizing time reversal locally ruptures microcapsules containing chemical or genetic therapeutic agents.

38. A system for noninvasively focusing acoustical energy on a mass in a substance to reduce or eliminate said mass, comprising:

means for applying acoustic energy to said substance for detecting said mass,

means for localizing said mass,

means for developing temporal signatures for driving said acoustical energy, and

means for dynamic focusing said acoustical energy through said substance on said mass to reduce or eliminate said mass.

39. The system of noninvasively focusing acoustical energy on a mass of claim 38 wherein said means for dynamic focusing said acoustical energy on said mass utilizes time reversal.

40. The system of noninvasively focusing acoustical energy on a mass of claim 39 wherein a small seed is placed at the point of interest to enhance time reversal.

41. The system of noninvasively focusing acoustical energy on a mass of claim 38 wherein said step of dynamic focusing said acoustical energy on said mass utilizes time reversal eigen-decomposition.

42. The system of noninvasively focusing acoustical energy on a mass of claim 41 wherein said step of acquiring the multistatic data matrix uses sets of orthogonal weights to increase signal-to-noise ratio.

43. The system of noninvasively focusing acoustical energy on a mass of claim 41 wherein the eigen-weights are selected so that corresponding singular values fit a desired pattern.

44. The system of noninvasively focusing acoustical energy on a mass of claim 41 wherein the eigen-weights are selected to minimize the error with a given reference.

45. The system of noninvasively focusing acoustical energy on a mass of claim 44 wherein the reference is calculated using a simple propagation model.

46. The system of noninvasively focusing acoustical energy on a mass of claim 38 wherein said means for dynamic focusing said acoustical energy on said mass utilizes modeling and time reversal.

47. The system of noninvasively focusing acoustical energy on a mass of claim 38 wherein said means for dynamic focusing said acoustical energy on said mass utilizes modeling.

48. The system of noninvasively focusing acoustical energy on a mass of claim 38 wherein said means for detecting the presence of said mass in said substance comprises transmitting an initial acoustic signal into said substance for detecting said mass and detecting said initial acoustic signal.

49. The system of noninvasively focusing acoustical energy on a mass of claim 48 wherein said means for developing temporal signatures to drive said acoustical energy on said mass comprises digitizing said initial acoustic signal and time-reversing said digitized initial acoustic signal.

50. The system of noninvasively focusing acoustical energy on a mass of claim 49 wherein said means for dynamic focusing said acoustical energy on said mass in said substance comprises using said time-reversed initial acoustic signal in focusing said acoustical energy on said mass in said substance.

51. The system of noninvasively focusing acoustical energy on a mass of claim 38 wherein said means for detecting the presence of said mass in said substance comprises applying acoustic energy propagated into said substance using an array of ultrasonic transducers.

52. The system of noninvasively focusing acoustical energy on a mass of claim 38 wherein said means for dynamic focusing said acoustical energy on said mass in said substance utilizing time reversal generates heat.

53. The system of noninvasively focusing acoustical energy on a mass of claim 52 wherein said heat essentially cooks said mass insuring reduction or elimination of said mass.

54. The system of noninvasively focusing acoustical energy on a mass of claim 38 wherein said step of dynamic focusing said acoustical energy on said mass in said tissue utilizing time reversal mechanically disrupts the tissue.

55. The system of noninvasively focusing acoustical energy on a mass of claim 38 wherein said step of dynamic focusing said acoustical energy on said mass in said tissue utilizing time reversal increases the porosity of the cell membranes in the tissue.

56. The system of noninvasively focusing acoustical energy on a mass of claim 55 wherein said increase of cell membrane porosity enhances the uptake of chemical or genetic therapeutic agents.

57. The system of noninvasively focusing acoustical energy on a mass of claim 38 wherein said step of dynamic focusing said acoustical energy on said mass in said tissue utilizing time reversal locally ruptures microcapsules containing chemical or genetic therapeutic agents.

58. A system for treating tissue by treating tissue within said tissue to reduce or eliminate said mass, comprising:

means for applying acoustic energy to said substance for detecting said mass,

means for localizing said mass,

means for developing temporal signatures for driving said acoustical energy, and

means for dynamic focusing said acoustical energy through said substance on said mass to reduce or eliminate said mass.

59. The system of treating tissue of claim 58 wherein said means for dynamic focusing said acoustical energy on said mass utilizes time reversal.

60. The system of treating tissue of claim 59 wherein a small seed is placed at the point of interest to enhance time reversal.

61. The system of treating tissue of claim 58 wherein said step of dynamic focusing said acoustical energy on said mass utilizes time reversal eigen-decomposition.

62. The system of treating tissue of claim 61 wherein said step of acquiring the multistatic data matrix uses sets of orthogonal weights to increase signal-to-noise ratio.

63. The system of treating tissue of claim 61 wherein the eigen-weights are selected so that corresponding singular values fit a desired pattern.

64. The system of treating tissue of claim 61 wherein the eigen-weights are selected to minimize the error with a given reference.

65. The system of treating tissue of claim 64 wherein the reference is calculated using a simple propagation model.

66. The system of treating tissue of claim 58 wherein said means for dynamic focusing said acoustical energy on said mass utilizes modeling and time reversal.

67. The system of treating tissue of claim 58 wherein said means for dynamic focusing said acoustical energy on said mass utilizes modeling.

68. The system of treating tissue of claim 58 wherein said means for detecting the presence of said mass in said substance comprises transmitting an initial acoustic signal into said substance for detecting said mass and detecting said initial acoustic signal.

69. The system of treating tissue of claim 58 wherein said means for developing temporal signatures to drive said acoustical energy on said mass comprises digitizing said initial acoustic signal and time-reversing said digitized initial acoustic signal.

70. The system of treating tissue of claim 69 wherein said means for dynamic focusing said acoustical energy on said mass in said substance comprises using said time-reversed initial acoustic signal in focusing said acoustical energy on said mass in said substance.

71. The system of treating tissue of claim 58 wherein said means for detecting the presence of said mass in said substance comprises applying acoustic energy propagated into said substance using an array of ultrasonic transducers.

72. The system of treating tissue of claim 58 wherein said means for dynamic focusing said acoustical energy on said mass in said substance utilizing time reversal generates heat.

73. The system of treating tissue of claim 72 wherein said heat essentially cooks said mass insuring reduction or elimination of said mass.

74. The system of treating tissue of claim 58 wherein said step of dynamic focusing said acoustical energy on said mass in said tissue utilizing time reversal mechanically disrupts the tissue.

75. The system of treating tissue of claim 58 wherein said step of dynamic focusing said acoustical energy on said mass in said tissue utilizing time reversal increases the porosity of the cell membranes in the tissue.

76. The system of treating tissue of claim 75 wherein said increase of cell membrane porosity enhances the uptake of chemical or genetic therapeutic agents.

77. The system of treating tissue of claim 58 wherein said step of dynamic focusing said acoustical energy on said mass in said tissue utilizing time reversal locally ruptures microcapsules containing chemical or genetic therapeutic agents.

78. A system for noninvasively focusing acoustical energy on a mass in a substance, comprising:

a detector that transmits an initial acoustic signal into saidsubstance, detects said mass, and produces an initial acoustic signal,

a processor that digitizes said initial acoustic signal,

a time-reversal processor that converts said initial acoustic signal that has been digitized into a time-reversal signal, and

an acoustic energy device that uses said time-reversal signal and focuses said acoustical energy on said mass in said substance.

79. A method of treating a mass within tissue, comprising:

receiving acoustic signals scattered from said tissue with a plurality of acoustic detectors disposed to at least partially surround at least a portion of said tissue;

applying treatment to said mass, wherein said step of applying treatment to said mass comprises directing acoustic radiation to said mass; and

evaluating the effect of said treatment on said mass by receiving acoustic signals scattered from said tissue with a plurality of acoustic detectors.

80. The method of claim 79, wherein said step of receiving acoustic signals scattered from said tissue provides information derived from the received acoustic signals and wherein said step of applying treatment to said mass further comprises focusing acoustic radiation into said mass in accordance with said information derived from the received acoustic signals.

81. The method of claim 79, wherein said step of directing acoustic radiation comprises applying time reversal.

82. The method of claim 79, wherein said step of receiving acoustic signals scattered from said tissue provides time reversal information derived from the received acoustic signals and wherein said step of applying treatment to said mass further comprises applying time reversal and focusing acoustic radiation into said mass in accordance with said applying time reversal information derived from the received acoustic signals.

83. The method of claim 79, further comprising determining a focal point with an object proximate said tissue.

84. The method of claim 79, further comprising depositing an acoustically reflective seed into said tissue.

85. The method of claim 79, wherein said step of applying treatment to said mass comprises sonoporating at least a portion of said tissue.

86. The method of claim 79, wherein said step of applying treatment to said mass comprises delivering chemotherapy to said mass by delivering microbubbles containing the chemotherapy to the location of said mass; and damaging said microbubbles to release said chemotherapy.

87. The method of claim 86, wherein said step of damaging said microbubbles comprises focusing acoustic radiation on said microbubbles.

88. The method of claim 79, wherein said step of applying treatment to said mass comprises delivering a genetic agent to said mass.

89. The method of claim 88, wherein said step of delivering a genetic agent to said mass comprises focusing acoustic radiation on said genetic agent.

90. The method of claim 79, wherein said step of applying treatment to said mass comprises ultrasound thermal therapy.

91. The method of claim 79, wherein said step of applying treatment to said mass comprises hyperthermic applications.

92. The method of claim 79, wherein said step of applying treatment to said mass comprises non-invasive surgery.

93. The method of claim 79, wherein said step of applying treatment to said mass comprises ultrasound non-thermal therapy.

94. The method of claim 79, wherein said step of applying treatment to said mass comprises controlled cavitation.